

WHAT IS CLAIMED IS:

1. A method for manufacturing a semiconductor device comprising the steps of:  
forming a metal layer over a partial region of a transparent substrate;  
forming a buffer layer covering the metal layer;  
forming an amorphous semiconductor film above the buffer layer so that the  
amorphous semiconductor film at least partially overlaps the formation region of the metal  
layer with the buffer layer therebetween; and  
polycrystallizing the amorphous semiconductor film through laser annealing to form a  
polycrystalline semiconductor film.

2. A method for manufacturing a semiconductor device according to Claim 1,  
wherein

the buffer layer alleviates thermal leakage caused by thermal conduction in the metal  
layer during polycrystallization of the amorphous semiconductor film through laser annealing.

3. A method for manufacturing a semiconductor device according to Claim 1,  
wherein

the buffer layer is obtained by forming a silicon nitride film having a thickness of  
approximately 50 nm at the side near the transparent substrate and forming a silicon oxide  
film having a thickness of 200 nm or greater at the side near the polycrystalline  
semiconductor film.

4. A method for manufacturing a semiconductor device according to Claim 1,  
wherein

the buffer layer is obtained by forming a silicon nitride film having a thickness of 100  
nm or greater at the side near the transparent substrate and forming a silicon oxide film having  
a thickness of 130 nm or greater at the side near a contact surface with the polycrystalline  
semiconductor film.

5. A method for manufacturing a semiconductor device according to Claim 1,  
wherein

the polycrystalline semiconductor film forms an active layer of a thin film transistor.

6. A method for manufacturing a semiconductor device, comprising the steps of:  
forming a metal layer over a partial region of a transparent substrate;  
forming a buffer layer over almost the entire surface of the transparent substrate  
covering the metal layer;

forming a first amorphous semiconductor film above the buffer layer such that the  
first amorphous semiconductor film at least partially overlaps the formation region of the

metal layer with the buffer layer therebetween and simultaneously forming a second amorphous semiconductor film above the non-formation region of the metal layer; and polycrystallizing the first and second amorphous semiconductor films through laser annealing to form a first polycrystalline semiconductor film and a second polycrystalline semiconductor film.

7. A method for manufacturing a semiconductor device according to Claim 6, wherein

the buffer layer alleviates thermal leakage caused by thermal conduction in the metal layer during polycrystallization of the first and second amorphous semiconductor films through laser annealing.

8. A method for manufacturing a semiconductor device according to Claim 6, wherein

the buffer layer is obtained by forming a silicon nitride film having a thickness of approximately 50 nm at the side near the transparent substrate and forming a silicon oxide film having a thickness of 200 nm or greater at the side near the first and second polycrystalline semiconductor films.

9. A method for manufacturing a semiconductor device according to Claim 6, wherein

the buffer layer is obtained by forming a silicon nitride film having a thickness of 100 nm or greater at the side near the transparent substrate and forming a silicon oxide film having a thickness of 130 nm or greater at the side near a contact surface with the first and second polycrystalline semiconductor films.

10. A method for manufacturing a semiconductor device according to Claim 6, wherein

each of the first and second polycrystalline semiconductor films forms an active layer of a thin film transistor.

11. A method for manufacturing an active matrix display device wherein

the active matrix display device comprises a pixel portion and a driver portion formed on a same substrate, the pixel portion having a plurality of pixels each comprising a pixel thin film transistor and a display element and the driver portion having a plurality of driver thin film transistors for outputting a signal for driving each pixel in the pixel portion, the method comprising the steps of:

selectively forming a metal layer above the substrate such that the metal layer is not formed over the formation region of the driver thin film transistor and is present over the

formation region of the pixel thin film transistor;

forming, as a buffer layer, a silicon nitride film and a silicon oxide film in that order over almost the entire surface of the substrate and covering the metal layer;

forming an amorphous semiconductor film over the buffer layer above the formation region of the pixel thin film transistor and above the formation region of the driver thin film transistor;

polycrystallizing, in a state wherein the buffer layer and the metal layer are present below the amorphous semiconductor film in the formation region of the pixel thin film transistor and the buffer layer is present below the amorphous semiconductor film in the formation region of the driver thin film transistor, the amorphous semiconductor film by irradiating laser onto the amorphous semiconductor film in a same laser annealing step; and

forming a gate electrode above the obtained polycrystalline semiconductor film with a gate insulation film therebetween to obtain a pixel thin film transistor and a driver thin film transistor each having, as an active layer, the polycrystalline semiconductor film obtained respectively in the formation region of the pixel thin film transistor and the formation region of the driver thin film transistor.

12. A method for manufacturing an active matrix display device according to Claim 11, wherein

each pixel further comprises a storage capacitor which has a first electrode electrically connected to the active layer of the pixel thin film transistor, and

a second electrode of the storage capacitor is formed by the metal layer.